Docket No.: ONAR-P01-001
(PATENT)

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Alon et al.

Application No.: 10/693,632          Confirmation No.: 8891

Filed: October 23, 2003             Art Unit: 2457

For:  METHOD AND SYSTEM FOR VALIDATING    Examiner: E. H. M. Sall
      LOGICAL END-TO-END ACCESS PATHS IN
      STORAGE AREA NETWORKS

## RCE AND AMENDMENT IN RESPONSE TO FINAL OFFICE ACTION

MS RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA  22313-1450

Dear Sir:

## INTRODUCTORY COMMENTS

In response to the Final Office Action dated December 12, 2008, please amend the above-identified U.S. patent application as follows.  A Request for Continued Examination is submitted concurrently herewith.  A Petition for Extension of Time, extending the time of response by 3 months to June 12, 2009 is also submitted concurrently herewith.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 9 of this paper.

## AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in this application:

1.      (Currently Amended) A process for validating a state of a storage area network (SAN), comprising the steps of:

defining a SAN access path policy representative of SAN logical access paths, said SAN logical access paths defining end-to-end access relationships between an application on a server, a sequence of one or more switches and physical links in the SAN, and data LUNs stored on storage devices in the SAN and having for the logical access paths an associated set of logical access path attributes consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path, wherein the SAN access path policy includes a list of valid access paths and an associated set of access path attributes for the valid access paths,

collecting configuration information from devices of the SAN, standardizing formats of the configuration information and reconciling conflicts,

processing the collected configuration information to identify the SAN logical access paths, and computing the associated access path attribute values, and

defining a state of the SAN based on SAN logical access path attribute values associated with the SAN logical access paths, the attribute values consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path, and

comparing the identified SAN logical access paths and computed access path attribute values with the list of valid access paths and associated set of access path attributes for the valid access paths in the SAN access path policy to identify any logical access path discrepancies or violations, thereby validating the state of the SAN.

2.      (Currently Amended)  The process of claim 1, and further including identifying a logical access path violation if at least one identified SAN logical access path is in disagreement with the

<u>list of valid access paths and associated set of access path attributes for the valid access paths in the</u> SAN access path policy.

3.      (Original)  The process of claim 1, and further including defining a SAN notification policy for notifying a user about SAN logical access path violations.

4.      (Original)  The process of claim 3, wherein notifying a user includes sending a message to the user with violation information, said message selected from the group consisting of email, graphic text and SNMP messages.

5.      (Currently Amended)  The process of claim 1, and further including identifying partial logical access paths, and comparing logical access path attribute values of the partial path<u>s</u> with the SAN logical access path policy.

6.      (Original)  The process of claim 1, wherein said configuration information includes device properties selected from the group consisting of server ID, server port configuration, switch port configuration, switch ID, switch IP and domain ID, grouping of devices, zoning of devices, storage device ID, LUNs of storage devices, and LUN masks.

7.      (Currently Amended)  The process of claim 1, wherein a logical access path attribute further comprises an <u>access path</u> attribute selected from the group further consisting of bandwidth, component interoperability, proximity constraints, and type of component authentication.

8.      (Original)  The process of claim 1, and further comprising user-defined grouping of at least two logical access paths that share at least one of the logical path attribute value or are within a range of predefined logical path attribute values.

9.      (Original)  The process of claim 1, wherein collecting configuration information includes polling a SAN device API, simulating a CLI session with a SAN device, communicating with a SAN device using a CIM or SNMP protocol, or a combination thereof.

10.     (Currently Amended)  The process of claim 1, and further comprising validating a change state event of the SAN <u>state</u> by

        collecting SAN event description information, and

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processing the SAN event description information to identify SAN logical access paths that have <u>access path</u> attribute values that do not comply with the SAN access path policy, thereby indicating a changed ~~state of the~~ SAN <u>state</u>.

11.      (Currently Amended)  A process for validating a state change event of a storage area network (SAN), comprising the steps of:

defining a SAN access path policy representative of SAN logical access paths, <u>said SAN logical access paths defining end-to-end access relationships between an application on a server, a sequence of one or more switches and physical links in the SAN, and data LUNs stored on storage devices in the SAN and having for the logical access paths an associated set of logical access path attributes consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path, wherein the SAN access path policy includes a list of valid access paths and an associated set of access path attributes for the valid access paths,</u>

defining a SAN state based on SAN logical access paths and attribute values associated with the logical access paths consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path,

obtaining SAN event description information, and

comparing the SAN event description information with the SAN state to identify a any logical path discrepancies or violations, thereby validating the state change event of the SAN.

12.      (Original)  The process of claim 11, and further defining a SAN change plan and comparing the SAN event description information with the SAN change plan.

13.      (Original)  The process of claim 11, wherein the SAN change event is selected from the group consisting of an erroneous change in a SAN device configuration, a planned change in a SAN device configuration and a device failure.

14.      (Original)  The process of claim 11, wherein the SAN event description is obtained by at least one of polling, trapping after an event occurs, by a direct administrator input, by an input from

a provisioning system about an intended change, by intercepting a change command before an event occurs.

15.     (Currently Amended)  A storage area network (SAN) validation manager, comprising:

a policy engine that stores a SAN access path policy representative of SAN logical access paths, said SAN logical access paths defining end-to-end access relationship between an application on a server, a sequence of one or more switches and physical links in the SAN, and data LUNs stored on storage devices in the SAN and having logical access path attributes with attribute values consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path, wherein the SAN access path policy includes a list of valid access paths and an associated set of access path attributes for the valid access paths,

a validation engine that collects configuration information from devices of the SAN, standardizes formats of the configuration information and reconciles any conflicts, The the validation engine further processing the collected configuration information to identify the SAN logical access paths and computing the associated logical access path attribute values, and comparing the identified SAN logical access paths and computed logical access path attribute values with the list of valid access paths and associated set of access path attributes for the valid access paths in the SAN access path policy to identify any logical access path discrepancies or violations.

16.     (Currently Amended)  The SAN manager of claim 15, further comprising a change engine that collects SAN event description information, and processes the SAN event information to identify SAN logical access paths that have access path attribute values that do not comply with the SAN access path policy, thereby indicating a changed state of the SAN.

17.     (Previously Presented)  The process of claim 1, wherein processing the collected configuration information to identify the SAN logical access paths and computing the associated access path attribute values includes:

constructing a graph representation of the network topology such that each node in the graph represents a device, and each edge represents an information flow capability between two devices,

wherein the information flow capability is determined by analyzing a physical communication link between the two devices and logical configuration settings on the two devices.

18.     (Currently Amended)  The process of claim 17, wherein identifying the SAN logical access paths and computing the associated access path attribute values further includes:

analyzing the network topology of the constructed graph, wherein analyzing the topology comprises enumerating sequences of edges from nodes representing hosts to nodes representing data on storage devices, and

characterizing each node and each edge in terms of the logical configuration setting.

19.     (Currently Amended)  The process of claim 18, wherein determining the access path attributes further includes:

analyzing the identified sequences of edges in the constructed graph,

enumerating a plurality of distinct logical access paths leading from a first node representing a host to a second node representing data on a storage device, and

analyzing at least one of ~~the level of end-to-end redundancy,~~ the number of hops, a level of end-to-end redundancy, and the number of allocated ports of each of the logical access paths, wherein the first node and the second node are different nodes.

20.     (Previously Presented)  The process of claim 11, wherein processing the collected configuration information to identify the SAN logical access paths and computing the associated access path attribute values includes:

constructing a graph representation of the network topology such that each node in the graph represents a device, and each edge represents an information flow capability between two devices, wherein the information flow capability is determined by analyzing a physical communication link between the two devices and logical configuration settings on the two devices.

21.     (Currently Amended)  The process of claim 20, wherein identifying the SAN logical access paths and computing the associated access path attribute values further includes:

analyzing the network topology of the constructed graph, wherein analyzing the topology comprises enumerating sequences of edges from nodes representing hosts to nodes representing data on storage devices, and

characterizing each node and each edge in terms of the logical configuration setting.

22.     (Currently Amended)  The process of claim 21, wherein determining the <u>access path</u> attributes further includes:

analyzing the identified sequences of edges in the constructed graph,

enumerating a plurality of distinct logical access paths leading from a first node representing a host to a second node representing data on a storage device, and

analyzing at least one of ~~the level of end-to-end redundancy,~~ the number of hops, a level of end-to-end redundancy, and the number of allocated ports of each of the logical access paths, wherein the first node and the second node are different nodes.

23.     (Previously Presented)  The process of claim 15, wherein processing the collected configuration information to identify the SAN logical access paths and computing the associated access path attribute values includes:

constructing a graph representation of the network topology such that each node in the graph represents a device, and each edge represents an information flow capability between two devices, wherein the information flow capability is determined by analyzing a physical communication link between the two devices and logical configuration settings on the two devices.

24.     (Currently Amended)  The process of claim 23, wherein identifying the SAN logical access paths and computing the associated <u>access path</u> attribute values further includes:

analyzing the network topology of the constructed graph, wherein analyzing the topology comprises enumerating sequences of edges from nodes representing hosts to nodes representing data on storage devices, and

characterizing each node and each edge in terms of the logical configuration setting.

25.     (Currently Amended)  The process of claim 24, wherein determining the <u>access path</u> attributes further includes:

analyzing the identified sequences of edges in the constructed graph,

enumerating a plurality of distinct logical access paths leading from a first node representing a host to a second node representing data on a storage device, and

analyzing at least one of ~~the level of end-to-end redundancy,~~ the number of hops, a level of end-to-end redundancy, and the number of allocated ports of each of the logical access paths, wherein the first node and the second node are different nodes.

## REMARKS

Applicants have carefully reviewed the Final Office Action ("Action") dated December 12, 2008. Claims 1-25 are pending in this application. Claims 1-16 stand rejected under 35 U.S.C §103(a) as being unpatentable in view of U.S. Patent No. 7,103,653 to Iwatani (hereinafter "Iwatani") and U.S. Patent No. 5,940,819 to Beavin et al. (hereinafter "Beavin"). Claims 17-25 stand rejected under 35 U.S.C. §103(a) as being unpatentable in view of Iwatani, Beavin, and U.S. Patent No. 5,825,772 to Dobbins et al. (hereinafter "Dobbins"). Claims 1, 2, 5, 7, 10, 11, 15, 16, 18, 19, 21, 22, 24 and 25 are currently amended to improve form. The claim amendments are fully supported by the originally-filed Specification, therefore, no new matter is added.

Independent claims 1, 11, and 15, recite, among other things, "SAN logical access paths defining end-to-end access relationships between an application on a server ... and data LUNs stored on storage devices in the SAN", the logical access paths having "an associated set of logical access path attributes consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path", "defining a state of the SAN based on SAN logical access path attribute values associated with the SAN logical access paths", and "comparing the identified SAN logical access paths and computed access path attribute values with the list of valid access paths and associated set of access path attributes for the valid access paths in the SAN access path policy to identify any logical access path discrepancies or violations, thereby validating the state of the SAN".

Applicants respectfully traverse and request reconsideration of the rejections in light of the comments below.

The combination of Iwatani and Beavin does not describe, teach, or suggest "logical access path attributes" as recited in independent claims 1, 11, and 15

The combination of Iwatani and Beavin fail to teach logical access path attributes "consisting of at least one of a number of hops within a valid logical access path, a level of end-to-

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end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path" as recited in independent claims 1, 11, and 15.

However, the Examiner states that "Iwatani teaches the invention substantially as claimed" (Action, Page 2) but that "Iwatani fails to teach explicitly logical access path attributes" as recited in claims 1, 11, and 15 (Action, Page 3). The Examiner also states that "Beavin teaches logical access path attributes (column 9, lines 32-41)" (Action, Page 3) and that "Beavin discloses determining an access path using these fields (i.e. "attributes" ...)" (Action, Page 4).

Applicants strongly disagree.

"All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)". MPEP §2143.03.

In making the rejections of independent claims 1, 11, and 15 using the combination of Beavin and Iwatani, the Examiner is not giving patentable weight to Applicants' claim language. In particular, the Examiner is not giving any patentable weight to "logical access paths" having "an associated set of logical access path attributes consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path" in claims 1, 11, and 15.

Applicants have reviewed the cited passages of Beavin (see Abstract, and Column 5, lines 6-8, Column 8, lines 44-52, Column 9, lines 31-41 in Beavin), and Beavin as a whole, and find no teaching of logical access paths or logical access paths attributes as recited in claims 1, 11, and 15. Beavin's access paths are merely query data access paths in a relational database management system. Therefore, the so-called "attributes" mentioned in Beavin, including "PLAN_TABLE: METHOD, CREATOR, TNAME, ... , PGROUP_ID" (Beavin, Column 9, Lines 32-41) cannot possibly be attributes, including "a number of hops", "a level of end-to-end redundancy", or "a number of allocated ports", of the logical access paths recited in independent claims 1, 11, and 15. In fact, such logical access path attributes simply do not exist for the query access paths in Beavin's relational database management system because logical access attributes such as the "a number of

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hops" or "a level of end-to-end redundancy" or the "number of allocated ports" for a valid logical access path, as recited in claims 1, 11, and 15, cannot be defined for Beavin's query access paths, merely a series of operations for implementing a SQL command.

Consequently, the combination of Iwatani and Beavin fails to teach, describe, or suggest each and every limitation of claims 1, 11, and 15 as required by 35 U.S.C § 103(a), and a prima facie case of obviousness has not been made. MPEP § 2143.03. For at least these reasons, claims 1, 11, and 15 are allowable, and the 35 U.S.C. §103(a) rejections of claims 1, 11, and 15 should be withdrawn.

<u>Combining Iwatani in view of Beavin would not predictably result in the subject matter in claims 1, 11, and 15</u>

"The mere fact that references <u>can</u> be combined or modified does not render the resultant combination obvious unless **>the results would have been predictable to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007)". MPEP §2143.01. "The rationale to support a conclusion that the claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination yielded nothing more than predictable results to one of ordinary skill in the art. *KSR*, 550 U.S. at ___, 82 USPQ2d at 1395." MPEP §2143.01.

One of ordinary skill in the art would not be able to apply the teachings of query access paths in Beavin to modify Iwatani to obtain the claimed subject matter recited in Applicants' claims 1, 11, and 15. It is a stretch to imagine one skilled in the art to use Beavin's description of <u>query access paths</u> to modify Iwatani's teachings of <u>logical access paths</u> because these two notions of access paths are distinct and mutually exclusive. It simply would not make sense to equate query access paths to logical access paths. Clearly, Beavin teaches query access paths in a relational database management system, as opposed to logical access paths in a storage area network that define "end-to-end access relationship between an application on a server and data LUNs stored on

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storage devices in a storage area network". It follows that the results obtained by one of ordinary skill in the art modifying Iwatani in view of Beavin are not predictable, and therefore, cannot possibly be obvious. Furthermore, as neither Beavin nor Iwatani teach, describe, or suggest computed access path attribute values such as "a number of hops", "a level of end-to-end redundancy", or "a number of allocated ports", and comparing access paths and access path attributes "with the list of valid access paths and associated set of access path attributes for the valid access paths in the SAN access path policy to identify any logical access path discrepancies or violations", modifying Iwatani in view of Beavin would not have resulted in the claimed subject matter in claims 1, 11, and 15.

Nonetheless, logical access paths with logical access path attributes such as "a number of hops", "a level of end-to-end redundancy", or "a number of allocated ports" are specifically recited in independent claims 1, 11, and 15. Therefore, Beavin and Iwatani, taken alone or in combination, do not teach logical access paths having "an associated set of logical access path attributes consisting of at least one of a number of hops within a valid logical access path, a level of end-to-end redundancy for a valid logical access path, and a number of allocated ports for a valid logical access path" as recited in claims 1, 11, and 15.

Therefore, Iwatani and Beavin, taken alone or in combination, fail to teach, describe, or suggest the subject matter of claims 1, 11, and 15, and as required by 35 U.S.C § 103(a), and a prima facie case of obviousness has not been made. MPEP § 2143.03. For at least these reasons, claims 1, 11, and 15 are allowable, and the 35 U.S.C. §103(a) rejections of claims 1, 11, and 15 should be withdrawn.

Claims 2-10, 12-14, and 16-25 variously depend from, and add limitations to, independent claims 1, 11, and 15. Therefore, the 35 U.S.C. §103(a) Rejections of these claims should be withdrawn too.

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## <u>CONCLUSION</u>

In view of the foregoing amendments and remarks, Applicants believe the pending application is in condition for allowance.

Applicants believe that no fee is due with this response other than those indicated on the attached Transmittal Forms. However, if additional fees are due, please charge our Deposit Account No. 18-1945, under Order No. ONAR-P01-001 from which the undersigned is authorized to draw.

Dated:  May 22, 2009                              Respectfully submitted,

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Docket No.: ONAR-P01-001
(PATENT)

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Alon et al.

Application No.: 10/693,632                          Confirmation No.: 8891

Filed: October 23, 2003                              Art Unit: 2457

For:  METHOD AND SYSTEM FOR VALIDATING        Examiner: E. H. M. Sall
      LOGICAL END-TO-END ACCESS PATHS IN
      STORAGE AREA NETWORKS

## NOTICE REGARDING RE-SUBMISSION OF AMENDMENT AFTER FINAL

MS RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA  22313-1450

Dear Sir:

Applicants attach herewith an electronically-signed Amendment after Final.  The originally e-filed submission of the Amendment (EFS acknowledgement receipt ID 5381971) did not have the practitioner's electronic signature.  Except for the addition of the electronic signature, no other changes have been made to the originally-submitted Amendment.

Applicants believe that no fee is due with this response.  However, if additional fees are due, please charge our Deposit Account No. 18-1945, under Order No. ONAR-P01-001 from which the undersigned is authorized to draw.

Dated:  May 22, 2009                    Respectfully submitted,
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| **EFS ID:** | 5386261 |
| **Application Number:** | 10693632 |
| **International Application Number:** | |
| **Confirmation Number:** | 8891 |
| **Title of Invention:** | Method and system for validating logical end-to-end access paths in storage area networks |
| **First Named Inventor/Applicant Name:** | Roee Alon |
| **Customer Number:** | 28120 |
| **Filer:** | Tushar Anil Parlikar/Lise Ann Ruggeri |
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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Amendment After Final | Amendment.pdf | 62185<br>9131ca7f0147a50718e08dc0127ae0cb9cb10738 | no | 13 |

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.